EO-1 Ground System Requirements Overview

- Derivation of ground system requirements

  – New Millenium Program Goals

  – Inital project documentation (which ones?)

  – Spacecraft Design Convergence Review (DCR)

  – Science instrment documentation

  – Techninal interface meetings involving Wallops, EO-1 Project, Swales, Litton, Jackson and Tull, Code 400, 500 and 700 elements, Lincoln Labs
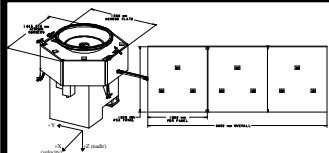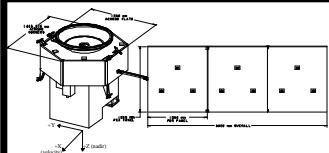
- High Level Mission Requirements
  - EO-1 will validate technologies contributing to the reduction in cost of Landsat follow-on missions
  - EO-1 will provide 100-200 paired scene comparisons between the ALI and the Landsat 7 imager, ETM+
  - The EO-1 imaging system will incorporate alternative and innovative approaches to future land imaging, including two different hyperspectral imaging techniques
  - Mission operations for the EO-1 mission will be conducted from the MOC at GSFC and supported by NASA ground stations at Wallops; Alaska; Spitzbergen, Norway; and McMurdo, Antarctica
  - EO-1 will validate technologies contributing to the reduction in cost of Landsat follow-on missions
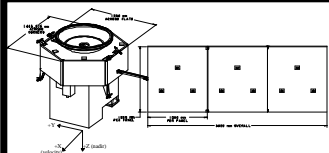
- High Level Mission Requirements (continued)
  - The EO-1 project will provide inputs to the mission planning process
  - The EO-1 spacecraft will be launched on a TBD launch vehicle from Vandenberg Air Force Base, California
  - The nominal operational orbit will be a circular polar orbit with an altitude of 705 km, an inclination of 98.2 degrees, an orbital period of 98.9 minutes, and a descending node of approximately 10:01 AM
  - Voice communications are required between the MOC, the EO-1 Science Data Center, the Landsat 7 MOC, the Eastern Test Range (launch only), and the ground stations - voice lines will be provided for this by Nascom
  - The EO-1 launch window shall place the spacecraft in the same plane as Landsat 7

- Mission Command and Control System High Level Requirements
    - Schedules for spacecraft operations will be created in the MCC with inputs from the Science Data Center and NMP office
    - Scheduling between the MCC and AWOTS will utilize the Wallops Scheduling Group via the Internet
    - Command loads will be created to send up to the spacecraft at least once a week
    - Real time commands will be sent from the Real Time System either by a person, or through the autonomous function of the Real Time System
    - Telemetry will nominally be received through the primary ground station once or twice a day for a total of 20 minutes a day
    - Telemetry will be received, displayed, and trended in the MCC autonomously
    - Long and short term trending of recorded health and safety data will be performed in the MCC
    - Problems during autonomous supports will be dealt with automatically if the problem is pre recorded, or through an autonomous paging system
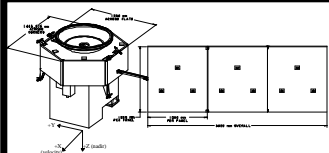
- Level Zero Processor High Level Requirements
  - Level zero processing will be performed in the MOC
  - Raw data will be archived in the MOC by the LZP
  - Data will be transferred to the Science Data Center after Level Zero Processing has been performed on it
  - The Level Zero Processing System will interface with the MCC to receive spacecraft data
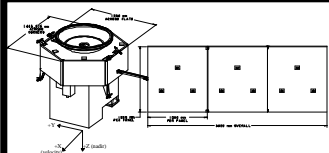
EO-1 Ground SRR

- Ground Station High Level Requirements
    - The primary ground station will be the Automated Wallops Orbital Tracking Station (AWOTS) at either Wallops Island, Virginia, or Spitzbergen, Norway
    - McMurdo will provide real time support during maneuvers
    - Recorded telemetry (105 Mb/sec X-band and 3 Mb/sec S-band backup) will be sent to the ground and recorded on site at the primary ground station, temporarily archived, and either mailed or rate-buffered to the MOC over data links of T1 or less bandwidth
    - Real-time data (3000, 250, 32, or 2 Kb/sec S-band) from EO-1 will be received by the primary ground station and routed to the MOC in real-time or near real-time
    - The Wallops, NASA, CNES, and AFSCN stations will be used for launch support augmentation
   - Commands will be throughput to the spacecraft upon receipt at the station

- Flight Dynamics System High Level Requirments
  - The flight dynamics system will ensure the spacecraft is controlled so that it maintains an orbit with high precision relative to Landsat 7 (formation flying) by evaluation and confirmation of spacecraft data
  - The flight dynamics system will be used in the validation of the autonomous orbit determination and maneuver operations functions of EO-1, and computed maneuver commands will be uplinked if the on-board system fails
  - The flight dynamics system will be used to generate ground station view periods and other scheduling aids, spacecraft antenna pointing angles, and attitude products for image processing
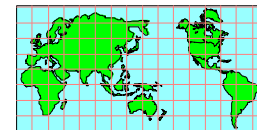 - The flight dynamics system will interface with the MCC
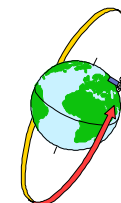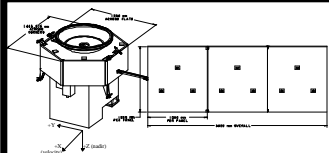
- Science Data Center High Level Requirements

  – The EO-1 Science Data Center will provide planning products to the MCC

  – The EO-1 Science Data Center will provide an off-line function to generate level-1 EO-1 imager scenes, and make comparisons with, and appropriate corrections to, corresponding scenes from Landsat 7

  – EO-1 scenes will be processed through radiometric, atmospheric, and geometric correction processes

  – Paired EO-1/Landsat 7 scenes will be archived and distributed

  – The EO-1 Science Data Center will plan image taking based upon interaction with the Landsat 7 science team